

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN FRANCISCO BAY REGION

ORDER NO. 90-134

AMENDING ORDER NO. 89-167, SITE CLEANUP REQUIREMENTS FOR:

APPLIED MATERIALS, INC.  
3050 BOWERS AVENUE BUILDING 1 FACILITY  
CITY OF SANTA CLARA, SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter called the Regional Board) finds that:

1. Location and Responsible Party. Applied Materials, Inc. (AM), hereinafter called the discharger, owns and operates the Building 1 facility at 3050 Bowers Avenue in the City of Santa Clara, for the purpose of manufacturing vapor deposition equipment used in the semiconductor industry. Building 1 is located on a nine-acre site about 6.4 miles south of San Francisco Bay and within one mile of Calabazas, Saratoga, and San Tomas Aquino Creeks. It is in an area of light industrial and commercial development and has been in operation since 1970. Prior use of the area was for agriculture.

Pursuant to Health and Safety Code Sections 25356.1 (c) and (d), the discharger is the only identified or known responsible party associated with the release of pollutants to the subsurface at this location.

2. Chemicals Detected. Volatile organic chemicals (VOCs) were first detected in groundwater in November 1983, in the vicinity of three underground tanks at the west side of Building 1. The predominant pollutant in 1983 was trichloroethane (1,1,1-TCA) at concentrations up to 12,000 parts per billion (ppb); also detected were trichloroethylene (TCE), dichloroethylene (1,1-DCE), dichloroethane (1,1-DCA), Freon 113, and other VOCs.

Analytical results of January - June 1989 show the presence in groundwater onsite of: 1,1,1-TCA at 1,100 ppb; 1,1-DCA at 120 ppb; 1,1-DCE at 50 ppb; TCE at 20 ppb; PCE at 9 ppb; 1,2-DCA at 2.3 ppb; 1,2-DCE at 0.6 ppb; 1,1,2-TCA at 1.0 ppb; Freon 113 at 170 ppb; and Freon 11 at 48 ppb. Any other VOCs were below detection limits.

Prior to the discovery of subsurface pollution at Building 1, significant VOC concentrations had been detected at three sites bordering the AM property. However, VOC plumes from neighboring sites do not appear to extend to the AM Building 1 site and it is probable that no VOCs were present in the shallow groundwater at Building 1 prior to onsite release.

VOCs are identified as either carcinogenic (cancer-causing) or noncarcinogenic (not cancer-causing). The VOCs found in the subsurface at this site include several which have been categorized by the EPA as being able to cause cancer in humans: (1) possible human carcinogen - 1,1-DCE, and 1,1,2-TCA; (2) probable human carcinogen - TCE, PCE, 1,1-DCA and 1,2-DCA (EDC). Chloroform, a probable human carcinogen, was reported episodically in onsite samples collected from 1983 through 1986 and in 1988. Vinyl chloride, a known human carcinogen, was reported twice, once in 1983 and once in 1985, in samples from two different source-area wells; and more recently (1990) in samples from a newly installed extraction well.

3. NPL and Orders. The site is on the National Priorities List (NPL) and is regulated by Regional Board Orders, as indicated herein:

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|----|--------------------|--|
| a. | October 15, 1984   | Site proposed for the NPL.   |
| b. | June 19, 1985      | Regional Board adopted NPDES Permit No. CA0028851, for the discharge of treated water to a storm drain system tributary to San Tomas Aquino Creek and South San Francisco Bay. |
| c. | September 17, 1986 | Regional Board adopted waste discharge requirements for the site.  |
| d. | July 22, 1987      | Site added to the final NPL.   |
| e. | December 21, 1988  | Regional Board adopted a revised NPDES Permit No. CA0028851 (expires June 19, 1990).   |
| f. | June 20, 1990      | Regional Board adopted permit renewal for NPDES Permit No. CA0028851.  |

4. Lead Agency. Pursuant to the South Bay Multi-Site Cooperative Agreement and the South Bay Ground Water Contamination Enforcement Agreement, entered into on May 2, 1985 (as

subsequently amended) by the Regional Board, EPA and DHS, the Regional Board has been acting as the lead regulatory agency. The Regional Board will continue to regulate the discharger's remediation and administer enforcement actions under CERCLA as amended by SARA.

5. Hydrogeology. The facility is in the Santa Clara Valley which is a sedimentary basin filled with unconsolidated heterogeneous alluvial material, sometimes interspersed with layers of marine clay. The alluvium is a mixture of permeable water-bearing sands and gravels interbedded with less permeable silts and clays. The soils are extremely variable over short distances, both horizontally and vertically.

Water-bearing deposits in the Valley and at the Building 1 site are generally divided into three laterally traceable units, beginning with the near-surface A zone and progressing with depth through the B zone and into the C zone. The top of the A zone is found at depths between nine and 15 feet below the surface, and the B at between 42 and 47 feet. The A and B zones are separated by a layer of silty clay at least five feet thick.

Groundwater is found at a depth of about eight feet in the A zone and is confined or semiconfined. Groundwater flow is to the northeast, at a calculated velocity of about two feet per day. An upward hydraulic gradient between the A and zones is indicated by water level measurements. Water in the A and B zones at, and in the near vicinity of, this site is not withdrawn for any use other than interim remedial action at present.

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The C zone is from 150 to more than 500 feet below the surface, and contains aquifers which produce water for domestic and other uses. The C zone aquifers are separated from the shallow A/B aquifers by clay layers between about 50 and 150 feet. The clay layers can provide an effective natural barrier to vertical groundwater movement, but are not universally present; and the integrity of clay barriers which are present may be compromised at specific locations by abandoned wells which are improperly sealed and act as conduits for the vertical migration of pollutants.

VOCs at this site are found in fine-grained silts and clays in the depth interval of eight to 19 feet, and in the groundwater and soils of the underlying gravelly sand of the A zone aquifer which is five or more feet thick. VOC pollution has also been found in the B zone, to a limited extent, and more recently in the A-2 interval between the A and B aquifers. The AM pollutant plume in 1983 had migrated in the subsurface a distance of 700 feet or more from the source area

to the northeast, and vertically downward to a depth of about 50 feet below the surface. The present (1989) areal extent of the plume is similar to what it was earlier, but the concentration of 1,1,1-TCA has decreased from a range of 4,000 to 12,000 ppb in 1983, to 50 to 1,000 ppb at present

No water supply wells, active or abandoned, are located within the AM plume. The nearest former water supply well, more than 500 feet deep and in the C zone, was located east of Building 1 and just beyond the eastern margin of the plume. This well was destroyed in April 1986 under supervision of the Santa Clara Valley Water District. The presence of minor amounts of VOCs has been detected in the C zone in a number of wells in the Santa Clara Valley. The nearest such occurrence to the Building 1 facility is in a municipal water supply well more than 600 feet deep, designated #20-02, about 6000 feet west of Building 1. The source of pollution in this well is not believed to be the plume at the Building 1 site.

6. Interim Actions. On its own volition, AM in November 1983 installed a monitoring well downgradient of a nest of three underground tanks on the west side of Building 1. When VOCs were detected in groundwater by this well AM voluntarily began an investigative program and has conducted site investigations and remedial actions, in cooperation with the Regional Board, since that time.

The detection of total VOCs in concentrations up to 65 milligrams per liter (mg/l) in soil samples collected in the vicinity of the underground tanks in 1984 and 1985 suggested that the VOCs were released from the tanks and/or associated piping and that this was the source area. The tanks have been excavated and removed. About 60 cubic yards of polluted soil were also removed. More soil was not removed because of a perceived threat to the integrity of the Building 1 structure. The quantity of polluted soil yet remaining in place may be at least equal to that which has been removed.

After the tanks were removed, the excavation was filled and converted into an extraction pit. About 10,000 gallons of water were extracted to remove sediment and develop the pit. An analysis of a water sample collected in 1985 revealed the presence of more than 400 mg/l (400,000 ug/l) total VOCs. This may indicate the presence of soil "hot spots" which can leach VOCs into groundwater.

The discharger has installed and maintains nine onsite monitoring wells, including seven in the A zone and two in the underlying B zone, and three piezometers in the A zone in the vicinity of the extraction pit.

The AM plume was defined by July 1984, after which interim remedial action by extraction wells and groundwater treatment/discharge was implemented. As of September, 1990, the extraction system consists of three wells and the pit, discharging to a common air-stripper treatment unit. Extraction appears to be effective in containing the AM plume. The quantity of VOCs removed thus far by interim pumping is considerably more than the amount believed to have been in the ground before extraction began. This suggests the presence of concentrated pockets of VOCs in the source area.

7. NPDES Discharge. The extracted groundwater currently in the range of 20,000 to 26,000 gallons per day (gpd), is discharged under an NPDES permit, Regional Board Order No. 90-077, after treatment by air-stripping, to a storm drain system tributary to San Tomas Aquino Creek and South San Francisco Bay. Under Order No. 90-077 the discharge of wastes containing constituents in excess of stated limits is prohibited. The discharge of most VOCs must not exceed a concentration of five parts per billion (5 ppb) for each VOC.
8. Remedial Investigation/Feasibility Study and Remedial Action Plan. The discharger has submitted a Remedial Investigation and Feasibility Study (RI/FS) Report which satisfies the requirements of Regional Board Order No. 86-71, Waste Discharge Requirements. This report includes five alternative remedial action plans, an evaluation of remediation alternatives, a public health evaluation, and a proposed final remedial action plan (RAP). The discharger has proposed that: water reuse is infeasible, the benefits of reinjection are doubtful, discharge to a POTW is unacceptable, and discharge to San Tomas Aquino Creek constitutes a beneficial use in enhanced fresh water flow to South San Francisco Bay.

The RI/FS Report, originally dated February 19, 1988 was revised and updated and submitted to the Board on June 14, 1989. The proposed final Remedial Action Plan (RAP) was presented to the Regional Board for informational purposes at the Board Meeting of June 21, 1989, at which the public comment period on the RAP was opened. A Public Meeting to obtain comments on and public input to the proposed final RAP was held in the City of Santa Clara on June 29, 1989.

The RI/FS Report's discussion of Applicable or Relevant and Appropriate Requirements (ARARs) is included within the overall discussion of "Public Health and Environmental Impacts", and is based on statements in the EPA (1986) Superfund Health Evaluation Manual. The report states that, according to the EPA: the predicted exposure point concentrations should be compared to ARARs for the indicator VOCs; Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are

considered the most appropriate ARARs for potential groundwater exposure via drinking water. A MCL represents the allowable lifetime exposure to the chemical for a 70-kg adult who is assumed to ingest two liters of water per day. The MCLs for reported indicator chemicals at this site are: 200 ppb for 1,1,1-TCA and 6 ppb for 1,1-DCE, the same for both the EPA and the DHS. An EPA MCL is not available for 1,1-DCA, but the DHS MCL is 5 ppb and this is used for an ARAR for the third indicator chemical.

The primary exposure route for the discharger's pollution is through the ingestion (drinking) of polluted water. Another exposure route is through inhalation. The discharger has evaluated potential human health effects resulting from the presence of VOCs in the groundwater, by (1) calculating exposure point concentrations for indicator VOCs and comparing these to Applicable or Relevant and Appropriate Requirements (ARARs); and (2) calculating exposure risks for a Maximally Exposed Individual (MEI) at the site of highest estimated exposure, a number of years in the future. The discharger concluded that for (1) all exposures are lower than ARARs, inferring that human health was not threatened, even in the absence of cleanup. For (2), the discharger concluded that there probably would be no health hazards associated with exposure to noncarcinogenic chemicals, but there would be some risk due to the presence of carcinogens, in the absence of cleanup. The Board finds that the projected concentrations of carcinogens in the near-source groundwater, may, upon exposure, be a threat to human health.

The discharger's RI/FS has evaluated five alternative cleanup plans: (1) removal of all soil and groundwater containing VOCs, (2) partial soil removal by excavation with shored sheet piling or sheeting and shoring (two levels of removal) and groundwater pump and treat, (3) partial soil removal by augered caisson excavation (two levels of removal) and groundwater pump and treat, (4) VOC containment and removal by groundwater extraction, treatment and discharge (pump and treat), and (5) a no-action alternative. The discharger also evaluated VOC removal by soil-gas venting and borehole mining. Based on the alternatives evaluated, the discharger recommends groundwater pump and treat as a final remedial action plan. The Board concludes that pump and treat can remove VOCs from groundwater, but that as the sole measure of remediation, it will take a long period of time to achieve cleanup standards; and that soil remediation in conjunction with pump and treat will effectively accelerate VOC removal.

The proposed final RAP was presented to the Board as an informational item at the Board Meeting of June 21, 1989. A Public Meeting was held by Board staff in Santa Clara on June

29 to receive comments on and public input to the proposed final RAP.

After the Order was adopted by the Board, the discharger complied with requirements of the Order and submitted a report, "Assessment of VOCs in Soil at Applied Materials Building 1, Santa Clara, California" (Task 5), dated January 29, 1990, which identified an additional VOC source requiring further evaluation; and implemented additional work to further evaluate near-source-area soil pollution. Work was hindered by limited access due to the presence of a mechanical (equipment) pad and below-surface electrical power and utility lines in the area being investigated.

Tasks 6 and 7 related to soil cleanup evaluation and soil cleanup proposal have not been completed as required by the original Order. Because Task 5 showed that additional soil investigation was required, Task 5 was not completed until approximately ten weeks after its due date, and therefore Task 6 could not be completed by its due date of February 28, 1990. The completion of Task 7, with an original due date of March 16, 1990, is sequential following Task 6. Since Task 6 is delayed, Task 7 is also delayed and therefore has not been completed. A soil remediation system most likely will not be constructed and/or implemented as required in Task 8 and the dates for completion of other Tasks probably will not be met. Board staff acknowledges that the discharger is acting expeditiously in attempting to comply with requirements of the Order, and staff does not recommend enforcement action against the discharger. Staff recommends changing Task completion dates as shown herein.

Using the most recent information, the discharger has re-evaluated site cleanup alternatives and concluded that remediation can be accomplished either by groundwater extraction alone (Alternative 4) or by groundwater extraction combined with partial soil removal (Alternatives 2 and/or 3). For cost comparisons, the present worth costs are \$615,000 for Alternative 4 (extraction only) and \$3,300,000 and \$3,000,000 respectively for Alternatives 2 and 3 (extraction combined with partial soil removal). The estimated times to achieve cleanup standards are 53 years for Alternative 4 and 35 years each for Alternatives 2 and 3. For purposes of comparison, the discharger estimates (1990) that Alternative 1, removal of all polluted soil and groundwater, has a present-worth cost of \$8,000,000; and Alternative 5, no action, has a present-worth cost of \$654,984, based on a 100-year system life.

The discharger favors the adoption of Alternative 4 as the recommended cleanup remedy, possibly modified by some soil removal if future operational changes at Building 1 provide an opportunity to transfer manufacturing and research and

development activities out of Building 1 and into Building 3 and/or to-be-constructed Building 2A. The discharger states that the cleanup time for extraction alone may or may not be improved by some excavation of source materials. Staff favors adoption of a plan which includes both groundwater extraction and soil removal because of the belief that the removal of VOCs from fine-grained sediments will take longer than the time extrapolated for the sand-gravel aquifer (50 years, length of system life for Alternative 4, pump-and-treat, estimated by the discharger for purposes of comparison). There is reason to postulate that industrial operations in Building 1 could be curtailed or terminated beginning in two or three years from now, at which time soil removal could become more feasible.

9. Final Cleanup Plan. Based primarily on information submitted by the discharger in the RI/FS Report and subsequent reports, and review/comment by Board staff, EPA Region IX staff, and others, this Order provides for a final cleanup plan that includes:
  - a. Continued groundwater extraction from onsite aquifers until VOC concentrations are reduced to acceptable cleanup standards. Acceptable cleanup standards are the DHS MCLs (Maximum Contaminant Levels) or ALs (Action Levels) if MCLs have not been adopted, or the non-zero MCLGs (Maximum Contaminant Level Goals), whichever are more stringent.
  - b. The goal of this remedial action is to restore groundwater to its potential beneficial uses. Based on information obtained during the Remedial Investigation and on a careful analysis of all remedial alternatives, the Board believes that the selected remedy will achieve this goal. However, studies suggest that groundwater extraction and treatment alone will not be, in all cases, completely successful in reducing pollutants to health-based standards in the aquifer zones. The Board recognizes that operation of the selected extraction and treatment system may indicate the technical impracticability of reaching health-based groundwater quality standards using this approach. If it becomes apparent, during the operation of the system, that pollutant levels have ceased to decline and are remaining constant at levels higher than the remediation standard, that standard and the remedy may be re-evaluated.

The selected remedy will include groundwater extraction for a period of time that could approach or surpass 35 to 53 years, during which the system's performance will be carefully monitored on a regular basis and adjusted as



warranted by the performance data collected during operation. Modifications may include:

- (1) discontinuing operation of extraction wells where all cleanup standards have been attained, and pumping is not required for plume containment;
  - (2) alternating pumping at wells to eliminate stagnation points; and
  - (3) pulse pumping to allow aquifer equilibrium and encourage adsorbed pollutants to partition into groundwater.
- c. Remediation of soils containing more than one part per million (1 ppm) total VOCs is a cleanup standard. A different soil cleanup standard may be acceptable if: (1) the Executive Officer determines that higher levels of total VOCs can remain in soils without adversely affecting groundwater resources now or when groundwater extraction is terminated, or (2) the Executive Officer determines that it is infeasible to achieve the cleanup standard of 1 ppm and that public health and the environment will be protected. Information obtained from tests conducted on source area soils will be considered in determining if a different soil cleanup standard should be established.

Additional soil surveys have shown that VOCs are present in fine-grained sediments both above and below the A-aquifer from which groundwater is being extracted, and that water extracted from an interval (named the A-2) underlying the A-aquifer contains high concentrations (19,000 ppb) of total VOCs. There is no historical record of extraction from this unit, which adds to the uncertainty of determining how long it will take to remove VOCs by extraction alone.

- d. In the past, the operational status of Building 1 has been cited as a reason for not including soil removal in any cleanup plan proposed by the discharger. AM is proceeding with plans to construct a new building (Building 2A) near Building 1. A possible transfer of operations from Building 1 to Building 2A could begin within two or three years, at which time removal of polluted soil could become practical. Even though there is some uncertainty associated with the future use of Building 1, a procedure for reviewing the status and future of Building 1 is incorporated into the final cleanup plan.

- e. Reclamation and/or reuse of 100% of the groundwater that is extracted and treated is an objective of this plan.
  - f. Implementation of institutional controls, such as deed restrictions, which will control and restrict the withdrawal and use of onsite polluted groundwater, and control and limit activities that could result in exposure to VOC pollution is an objective of this plan. Control and restrictions within the plume will be necessary until MCLs have been achieved for all VOCs and these concentrations have stabilized.
  - g. Monitoring to document the achievement of cleanup standards is a requirement of the plan, and long-term monitoring may be required if MCLs cannot be maintained for one year after standards are achieved. The stability period will not begin until all standards have been achieved. Additional or replacement monitoring wells will be installed as required by the Board.
  - h. An ongoing review of the accomplishments of the cleanup plan will be conducted as various reports are submitted, including reports to satisfy Task requirements, Monitoring (Triannual) Reports, and Annual Reports. The overall effectiveness of cleanup activities will be evaluated after the receipt of the annual report and the 5-year status report.
10. Hazard Indices and Cancer Risk Numbers. The Hazard Index (HI) is the method used by the Board to assess the public health risk associated with the presence of multiple (usually non-carcinogenic) chemicals. This approach evaluates the sum of proportions of individual chemicals present:

$$HI = \frac{A}{RL \text{ of } A} + \frac{B}{RL \text{ of } B} + \dots + \frac{Z}{RL \text{ of } Z};$$

and assumes that multiple sub-AL/MCL exposures could result in an adverse effect and that the magnitude of the adverse effect will be proportional to the sum of the ratios of the exposures (A, B, .... Z) to reference levels (RL of A, B, Z). An HI less than or equal to 1 indicates that all chemicals of interest are present at or below relevant drinking water criteria.

The discharger has calculated exposure point concentrations for indicator VOCs (1,1,1-TCA; 1,1-DCA; and 1,1-DCE), and compared these to ARARs. The discharger has also calculated SDI to AIS ratios (subchronic daily intake to acceptable intake for subchronic exposure), and also CDI to AIC ratios (chronic daily intake to acceptable intake for chronic exposure). All the hazard indices resulting from these

calculations involving the three indicator chemicals show HIs less than 1. However, for the purpose of determining secondary cleanup levels for this site, the HI should include all the identified VOCs. Table 2 (Revised) lists all identified VOCs and indicates which are carcinogens as well as the chemicals of interest for HI calculations.

The carcinogens at this site have been identified as possible or probable cancer-causing substances in humans (vinyl chloride is identified as a known carcinogen). When cancer-causing substances are present and a threat of exposure to these substances exists, a potential risk is present. There is no "zero-risk" level associated with the threat of exposure to carcinogens. The potential aggregate effects of carcinogens are evaluated by use of cancer risk numbers, usually expressed as the number of excess cancers that may develop in a population; i. e., the  $10^{-6}$  or one-in-a-million risk, or the  $10^{-5}$  (one-in-100,000) risk. The concentrations (ppb or ug/l) which may result in the  $10^{-6}$  risk for the identified carcinogens (EPA, 1987) are: 0.06 for 1,1-DCE; 0.59 for 1,1,2-TCA; 3.0 for TCE; 0.67 for PCE; 0.38 for 1,2-DCA; 0.43 for chloroform; and 0.02 for vinyl chloride. The calculated  $10^{-6}$  risk number for 1,1-DCA is 0.39 ppb.

Using the combined sum of 1,1-DCE, TCE and PCE concentrations to represent the concentration of an indicator carcinogen (1,1-DCE), the discharger has calculated a cancer risk number of  $3.5 \times 10^{-4}$  for a hypothetical maximally exposed individual at the AM Building 1 site thirty years from now. In this estimate of impacts to human health (no-action alternative) the discharger reports that concentrations of VOCs at the source area in 30 years will be: 576 ppb 1,1,1-TCA; 57.6 ppb 1,1-DCA; 13 ppb 1,1-DCE; 5 ppb TCE; and 2 ppb PCE.

Even though the risk number of  $3.5 \times 10^{-4}$  results from a hypothetical consideration, it and the associated VOC residual concentrations expected to be present at the source area thirty years in the future are sufficient cause to pursue a remedial alternative other than no-further-action. The risk number of  $3.5 \times 10^{-4}$  is much greater than what would be considered an acceptable risk due to the presence of carcinogens in useable groundwater, and the postulated residual concentrations of onsite VOCs for the no-action alternative are higher than what would be considered acceptable; the VOC concentrations can be further reduced, and may be reduced to, or below, drinking water MCLs by remediation. The postulated residual VOC concentrations, including carcinogens, 30 years in the future indicates that source-area soil remediation may be necessary in order to achieve background levels and to restore groundwater to its original use-suitability within a reasonable time frame; and,

if required, to provide an extra margin of protection for human health and the environment.

In 1990 an EPA-approved methodology for determining risk was developed for the Regional Board. The risk potential of all identified carcinogens was evaluated by Board staff using this new methodology. The total excess cancer risk was calculated to be less than  $1 \times 10^{-4}$ .

The risk due to non-carcinogens at this site was also assessed. The Hazard Index (HI) for each potential exposure route, summed from calculated Hazard Quotients (HQs), was less than one.

The total carcinogenic risk, as now determined, is within the accepted EPA range when based on an evaluation of DHS MCLs, and the non-carcinogenic risk derived from these MCLs is less than 1.0 for each pathway. As a consequence of these determinations none of the cleanup standards must be reduced to less than the DHS MCL or AL, or the non-zero MCLG.

11. Final Cleanup Standards. While the cleanup objective is to restore groundwater quality by removing as much VOC-concentration as is feasible, another objective of major importance is to remove the potential threat posed by the presence of cancer-causing chemicals at the site. The process of removing carcinogens to the extent feasible will result in the removal of non-carcinogens as well. Therefore, the cleanup standards for the site A and B aquifers are the California DHS MCLs (Maximum Contaminant Levels) or ALs (Action Levels) if MCLs have not been adopted, or the non-zero MCLGs (Maximum Contaminant Level Goals), for drinking water, whichever are more stringent.

If the  $10^{-6}$  cancer risk concentrations for all VOCs are used to establish an aggregate cleanup level, this would be an attempt to approximate a return to background quality, but may not be practical. Increased flexibility to use a less stringent aggregate cleanup standard is indicated from consideration of the following: (a) the practical detection/quantification limits for some chemicals do not permit measurement by standard methods of such low concentrations; (b) there are no water-tap exposures above health-based levels actually occurring in the vicinity of this site at present or expected in the future; (c) the potential for human exposure from pathways other than domestic water uses are minimal to none; (d) there are no sensitive populations or special environmental receptors in the immediate vicinity of the site. As a consequence of these considerations, the  $10^{-6}$  cancer risk concentrations are not used to establish an aggregate cleanup standard.

For evaluation of total risk in each of the two categories (carcinogen and non-carcinogen) cleanup standards for the site A and B aquifers are established based on:

- a. California DHS MCL values for vinyl chloride; 1,1-DCA; 1,2-DCA; PCE; TCE; 1,1,1-TCA; 1,1,2-TCA; 1,1-DCE; 1,2-DCE; Freon 11; and Freon 113;
- b. DHS Toxic Substances Control Division AL (Applied Action Level) value for chloroform.

The soil remediation standard is 1 ppm total VOCs. This standard may be re-examined, if proposed by the discharger, based on additional information provided by the discharger obtained through site soil surveys and soil testing. Excavation and off-site disposal may not be the most preferred remediation method as this does not treat the soil or reduce the volume of chemicals; however, the removal of polluted soil may accelerate groundwater cleanup and thus soil removal combined with groundwater extraction may be the preferred remediation alternative.

12. Future Changes to Cleanup Standards. If new information indicates cleanup standards cannot be attained or can be surpassed, the Regional Board will decide if further final cleanup actions beyond those completed shall be implemented at this site. If changes in health criteria, administrative requirements, site conditions, or remediation efficiency occur, the discharger will submit an evaluation of the effects of these changes on cleanup standards as specified in Specification B.4.

The Regional Board recognizes that the discharger has already performed extensive investigative and remedial work onsite and that the discharger is being ordered hereby to perform additional remedial tasks. It is in the public interest to have the discharger undertake such remedial actions promptly and without prolonged litigation or the expenditure of public funds. The Regional Board recognizes that an important element in encouraging the discharger to invest substantial resources in undertaking such remedial actions is to provide the discharger with assurances that the remedial actions called for in this Order will be the final remedial actions required to be undertaken by the discharger. On the other hand, the Regional Board also recognizes its responsibility to protect water quality, public health, and the environment and that future developments could indicate that some additional remedial actions may be necessary. The Regional Board has considered and balanced these important considerations, and has determined that the remedial actions ordered herein represent the Regional Board's best, current judgement of the remedial actions to be required of the discharger. The

Regional Board will not require the discharger to undertake additional remedial actions with respect to the matters previously described herein unless: (1) conditions on the site, previously unknown to the Regional Board, are discovered after adoption of this Order, or (2) new information is received by the Regional Board, in whole or in part after the date of this Order, and these previously unknown conditions or this new information indicates that the remedial actions required in this Order may not be protective of public health and the environment. The Regional Board will also consider technical practicality, cost effectiveness, State Board Resolution No. 68-16 and other factors evaluated by the Regional Board in issuing this Order in determining whether such additional remedial actions are appropriate and necessary.

13. Groundwater Conservation. The Regional Board intends to strongly encourage, and require to the extent allowed by law, the maximum reclamation or reuse of groundwater feasible either by the discharger or other public or private water users. These measures include reinjection or reuse of extracted groundwater, and requiring the discharger to submit a plan for the reclamation or reuse of 100% of the extracted groundwater. Due to factors beyond the discharger's control, the discharger may be unable to attain the 100% reclamation or reuse goal established by this Order. The discharger will not be found in violation of this Order if documented factors beyond the control of the discharger prevent the discharger from attaining 100%, provided that the discharger made a good faith effort to attain that goal.
14. Evaluation of Final Plan. In accordance with the Health and Safety Code Section 25356.1, Section 121 of CERCLA, the final remedial action plan (including the RI/FS Report submitted by the discharger, this Order, and Order No. 88-171, NPDES Permit No. CA0028851) is equivalent to a feasibility study; satisfies the requirements of the California Water Code Section 13304 and is protective of human health and the environment; attains Applicable or Relevant and Appropriate Requirements (ARARs); utilizes permanent solutions and alternative treatment technologies and resource recovery technologies to the maximum extent possible for short-term effectiveness; is implementable; is cost effective; is acceptable based on State regulations, policies, and guidance; and reduces toxicity, mobility, and volume of pollutants.

The Board published a notice in the Santa Clara American on June 15, 1989 announcing the proposed cleanup plan and opportunity for public comment at the Board Meeting of June 21, 1989 in Oakland, prior to the beginning of the public comment period, and announcing opportunity for public comment at an evening public meeting to be held at the Santa Clara

Convention Center in the City of Santa Clara on June 29, 1989. The notice was published in the Santa Clara American again on June 22, 1989. Fact Sheets 1 and 2 were mailed to interested residents, local government officials, and media representatives. Fact Sheet 2, dated June 16, 1989 described the proposed final RAP, announced opportunities for public comment at the Board Meeting and the Public Meeting, and the availability of further information at the Information Repository at the Santa Clara Public Library. Public concerns expressed at the Regional Board meeting of June 21, 1989 in Oakland and at the public meeting of June 29, 1989 in Santa Clara, and in comments received by the Regional Board through July 20, 1989, the close of the public comment period; and in comments received at the Regional Board meeting of September 20, 1989 were addressed by review and evaluation, and incorporated by appropriate response in this Order.

15. Development of the Board's final Remedial Action Plan was based on the Regional Board's evaluation of almost five years of water and soil quality data. Random samples have been collected and analyzed by the Regional Board to confirm the validity of data generated by the discharger. Data has been validated using EPA validation guidance. The quality of this data has been taken into consideration and has been used in a manner consistent with the data's quality.
16. State Board Resolution 68-16. On October 28, 1968 the State Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California". This policy calls for maintaining existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses. The original discharge of waste to the groundwater at this site was in violation of this policy; therefore, the groundwater quality needs to be restored to its original or background quality to the extent reasonable. A return to background quality means achieving a restored groundwater throughout the site that has no detectable concentration of any VOC. Even if this condition were achieved for one or more VOCs temporarily, it appears unlikely that all VOCs can be completely removed permanently without the removal of all existing polluted soil and groundwater on the site. It may not be feasible to remove all the polluted soil and groundwater at this site.

For any VOC which is not reduced to a nondetectable concentration after a good-faith effort, a water quality objective consistent with maximum public benefit is determined, based on existing and potential use-suitability of State waters. This objective is to maintain all VOC concentrations at or below established protective standards throughout the site. The results of inorganic chemical analyses of groundwater in the

A and B zones do not preclude the use of this water as a domestic supply. For the purpose of establishing cleanup standards, the shallow groundwater in the A and B zones is designated a potential source of drinking water, and protective standards shall be those standards which have been established as protective of drinking water. For any VOC which cannot be reduced to a nondetectable concentration onsite, its concentration shall be maintained between a nondetectable concentration and a concentration protective of drinking water.

17. The Regional Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 16, 1986. The Basin Plan contains water quality objectives and beneficial uses for South San Francisco Bay and contiguous surface and underground waters.
18. The existing and potential beneficial uses of the groundwater underlying and adjacent to the facility include:
  - a. Industrial process water supply
  - b. Industrial service water supply
  - c. Municipal and domestic water supply
  - d. Agricultural water supply
19. The discharger has caused or permitted, and threatens to cause or permit, waste to be discharged or deposited where it is or probably will be discharged to waters of the State and creates or threatens to create a condition of pollution or nuisance. Final containment and remediation measures need to be implemented to alleviate the threat to the environment posed by the plume of pollutants.
20. This action is an order to enforce the laws and regulations administered by the Regional Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.
21. The Board has notified the discharger and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.
22. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the discharger, in order to meet the provisions contained in Section 13304 of the California Water Code and Section 25356.1 of the California Health and Safety Code, and regulations adopted thereunder, shall comply with the following:



A. PROHIBITIONS

1. The discharge of wastes or hazardous materials in a manner which will degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.
2. Further significant migration of chemicals through subsurface transport to waters of the State is prohibited.
3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of chemicals are prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil or groundwater containing chemicals shall not create a nuisance as defined in Section 13050 (m) of the California Water Code.
2. The discharger shall conduct monitoring activities as needed to define the current local hydrogeologic conditions, and the lateral and vertical extent of soil and groundwater containing chemicals. Should monitoring results show evidence of continuing pollutant migration, additional plume characterization may be required.
3. Final cleanup standards for VOC concentrations shall be determined for each well identified herein and all other onsite wells that may be installed for monitoring or extraction, unless otherwise determined by the Executive Officer:

Extraction Wells	Monitoring Wells	Piezometers
AM1-1	AM1-2	P-1
AM1-5E	AM1-3	P-2
AM1-EP	AM1-4	P-3
AM1-10	AM1-5 & AM1-5B	
	AM1-6	
	AM1-7	
	AM1-8	
	AM1-9	

These cleanup standards shall also apply to two offsite monitoring wells immediately north of the Building 1 site, identified as HP-1 and HP-6.

4. Final cleanup standards for all onsite and offsite wells shall be not greater than the standards as provided in Finding 11. The numerical final cleanup standards, therefore, shall not exceed the following in any instantaneous measurement:

<u>Chemical</u>	<u>Standard (ppb or ug/l)</u>
1,1-dichloroethane (1,1-DCA)	5
1,2-dichloroethane (1,2-DCA)	0.5
1,1-dichloroethylene (1,1-DCE)	6
1,2-dichloroethylene (1,2-DCE)	
cis	6
trans	10
tetrachloroethylene (PCE)	5
1,1,1-trichloroethane (1,1,1-TCA)	200
1,1,2-trichloroethane (1,1,2-TCA)	5
trichloroethylene (TCE)	5
freon 113	1,200
freon 11	150
chloroform	6
vinyl chloride	0.5

5. Groundwater cleanup objectives are: (a) restore the quality of a polluted water source to its potential suitability as a drinking water supply, (b) prevent exposure to polluted water, and (c) prevent pollution of the deeper aquifers (C zone) which presently supply water for domestic (drinking) and other beneficial uses.
6. The cleanup standard for source-area soils is 1 ppm for total VOCs. This standard may be modified by the Executive Officer if the discharger demonstrates with site specific data that higher concentrations of VOCs in the soil will not threaten the quality of waters of the State or that cleanup to this standard is infeasible and human health and the environment are protected.
7. The discharger shall optimize, with a goal of 100%, the reclamation or reuse of groundwater extracted as a result of cleanup activities. The discharger shall not be found in violation of this Order if documented factors beyond the discharger's control prevent the discharger from attaining this goal, provided the discharger has made a good faith effort to attain this goal.
8. The discharger shall implement the final cleanup plan described in Finding 9 and as may be modified by this Order.

C. PROVISIONS

1. The discharger shall submit to the Regional Board acceptable monitoring program reports containing results of work performed according to a program prescribed by the Regional Board's Executive Officer.
2. The discharger shall comply with this Order immediately upon adoption and the discharger shall further comply with the PROHIBITIONS and SPECIFICATIONS above, in accordance with the following tasks and compliance time schedule:

a. GROUNDWATER CONSERVATION

- 1) COMPLETION DATE: October 31, 1989

TASK 1: FINAL PLAN FOR DISPOSAL OF EXTRACTED GROUNDWATER. Submit a technical report acceptable to the Executive Officer describing the groundwater disposal plan associated with the final cleanup plan. This report shall include documentation of efforts to comply with the Regional Board Resolution No. 88-160, "Regional Board Position on the disposal of Extracted Groundwater from Groundwater Cleanup Projects", and reasons, if applicable, why potential users would not accept the water and justification for reasons why the water, with or without onsite treatment, cannot be used for beneficial purposes or be returned to the aquifer.

- 2) COMPLETION DATE: October 31, 1989

TASK 2: PROPOSAL FOR GROUNDWATER RECLAMATION. Submit a technical report acceptable to the Executive Officer which includes alternative proposals for reclamation of extracted groundwater, including the feasibility of onsite treatment to make the water suitable for beneficial uses. This report shall evaluate the feasibility, including cost estimates, of reusing the water and/or returning it to the source-aquifer, and shall include an implementation schedule for reclamation measures. This report shall include documentation that groundwater reclamation is infeasible, or a proposal for active groundwater reclamation.

- 3) COMPLETION DATE: December 15, 1989

TASK 3: GROUNDWATER RECLAMATION. Submit a technical report acceptable to the Executive Officer documenting completion of tasks necessary to implement groundwater reclamation.

If the Executive Officer has determined that groundwater reclamation is infeasible, this report shall include all information required for the reapplication for or renewal of the NPDES permit.

b. SOIL REMEDIATION

- 1) COMPLETION DATE: October 1, 1989

TASK 4: SUBMITTAL OF SOIL AND GROUNDWATER POLLUTION DATA. Submit a technical report acceptable to the Executive Officer which includes the results of chemical analyses for VOCs (a) in soil samples collected in the source area from locations under and exterior to Building 1, and (b) in groundwater samples collected from under the building and the three piezometers in the source area, after the submittal of the RI/FS Report incorporating RWQCB comments through June 14, 1989.

The report shall include a map(s) showing the locations of all sampling points and shall indicate the depth from which each sample was collected.

- 2) COMPLETION DATE: November 10, 1989

TASK 5: ASSESSMENT OF VOC POLLUTION IN SOIL. Submit a technical report acceptable to the Executive Officer which assesses the extent of VOC pollution in soil at the source area. This report shall include illustrations which show the horizontal and vertical extent of VOCs in soil including the concentrations of total VOCs which are equal to and greater than one part per million (ppm). This report shall also include (a) an evaluation of the adequacy of the available data for depicting the distribution and concentrations of VOCs in soil, and (b) a proposal for obtaining additional data in a timely manner, if the available data are considered inadequate.

- 3) COMPLETION DATE: November 2, 1990

TASK 6: SOIL CLEANUP EVALUATION PROGRESS REPORT. Submit a technical report acceptable to the Executive Officer containing soil boring logs and analytical soil data from the additional (supplemental) soil borings at the Building 1 site.

- 4) COMPLETION DATE: January 15, 1991

TASK 7: SOIL CLEANUP EVALUATION/SOIL CLEANUP PROPOSAL. Submit a technical report (Part I) acceptable to the Executive Officer describing a soil remediation plan associated with the final cleanup plan. This report shall contain a narrative and illustrations which describe the VOCs remaining in the source-area soils, quantification of the amount of polluted soil remaining onsite, and a determination of the feasibility of remediating polluted soils. This report shall include a determination of what residual levels of soil pollutants could remain onsite without being a health hazard or polluting groundwater above health-based standards, and shall evaluate the effect on the time required to reach groundwater cleanup standards if soil pollution is removed wholly or in part. This report shall also include an analysis of the anticipated transformation of onsite VOCs into degradation or other products and chemicals which could occur during the time period of the final RAP, and which could result in potential increased toxicity and resultant health effects due to exposure.

Submit a technical report (Part II) acceptable to the Executive Officer proposing soil remediation, or documenting that it is not feasible to attempt to reach a soil cleanup standard of 1 ppm total VOCs. If the latter documentation is provided, it should be accompanied by documentation to support another soil cleanup standard proposed by the discharger. This report shall include design information based on soil boring logs, the results of chemical analyses of soil samples, information obtained from other field and laboratory tests of onsite soils, and relevant air and water monitoring data. The report may include a proposal(s) for staged soil remediation over a period of time, and a

remediation design based upon the latter proposal, as alternative(s) to be considered.

The Part I and Part II Reports may be submitted as a combined report.

- 5) COMPLETION DATE: To be determined; dependent upon proposal of Task 7 and future status of Building 1 but 60 days following request made by the Executive Officer

TASK 8: SOIL REMEDIATION SYSTEM. Submit a technical report acceptable to the Executive Officer documenting construction and implementation of a soil remediation system approved by the Regional Board.

- 6) COMPLETION DATE: To be determined, but no later than 60 days following request made by the Executive Officer

TASK 9: MODIFICATIONS TO THE SOIL REMEDIATION SYSTEM. Submit a technical report acceptable to the Executive Officer which evaluates the effectiveness of the system constructed and implemented in Task 8. The report should propose any modifications necessary to accomplish the site cleanup standard of not more than 1 ppm total VOCs, or another standard acceptable to the Executive Officer.

- 7) COMPLETION DATE: To be determined, based upon completion of Task 9, but no later than 60 days following request made by the Executive Officer

TASK 10: SOIL CLEANUP FINAL DESIGN REPORT. Submit a technical report acceptable to the Executive Officer which documents completion of any modifications identified in Task 9.

- 8) COMPLETION DATE: 30 days prior to expected termination of soil cleanup

TASK 11: PROPOSAL TO TERMINATE OPERATION OF THE SOIL CLEANUP SYSTEM. Submit a technical report acceptable to the Executive Officer and the EPA containing a proposal for terminating operation of the soil remediation system and criteria used to justify this action. This report shall include a proposal indicating the locations of borings and sampling intervals to

determine concentrations of VOCs remaining in the soil.

- 9) COMPLETION DATE: Due date for quarterly status report for the quarter in which operation of the soil remediation system is terminated.

TASK 12: COMPLETION OF ONSITE SOIL REMEDIATION. Document in the appropriate quarterly report the completion of the necessary tasks identified in the technical report submitted for Task 11 including the results of chemical analyses of samples from the soil borings.

c. INSTITUTIONAL CONSTRAINTS

- 1) COMPLETION DATE: November 1, 1990

TASK 13: PROPOSED CONSTRAINTS. Submit a technical report acceptable to the Executive Officer documenting procedures to be implemented by the discharger for assuring that the use of onsite groundwater for drinking water supply will be prohibited, and for prohibiting onsite activities that could endanger the public health or the environment due to exposure to VOCs. Constraints shall remain in effect until cleanup goals have been achieved and have stabilized in onsite aquifers. These procedures shall include a proposal to implement deed restrictions.

- 2) COMPLETION DATE: November 30, 1990

TASK 14: CONSTRAINTS IMPLEMENTED. Submit a technical report acceptable to the Executive Officer documenting that the proposed and approved deed restrictions have been implemented.

d. EXTRACTION SYSTEM AND MONITORING SYSTEM

- 1) COMPLETION DATE: 60 days prior to implementation by the discharger

TASK 15: MODIFYING EXISTING EXTRACTION AND TREATMENT SYSTEM OR MONITORING WELL SYSTEM. Submit a technical report acceptable to the Executive Officer which documents a proposal to modify, workover or replace any existing

extraction well or pit, or install one or more new extraction wells or pits associated with cleanup activities at this site; or a proposal to modify the monitoring well system by making major well-construction changes, abandoning an existing well(s) or installing a new well(s).

This report is required only if a change is proposed, and for all changes that are proposed.

- 2) COMPLETION DATE: 30 days following implementation by the discharger

TASK 16: IMPLEMENTATION OF CHANGE. Submit a technical report acceptable to the Executive Officer which documents any change made in the extraction/treatment system and any major change in the monitoring well system.

e. CURTAILING ONSITE GROUNDWATER EXTRACTION

- 1) COMPLETION DATE: 90 days prior to proposed implementation of onsite groundwater extraction curtailment

TASK 17: ONSITE WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from onsite groundwater extraction well(s) and pit(s) and the criteria used to justify such curtailment. This report shall include data to show that cleanup standards for all VOCs have been achieved and have stabilized or are stabilizing, and that the potential for pollutant levels rising above cleanup standards is minimal. This report shall also include an evaluation of the potential for pollutants to migrate downwards to the C aquifer at this location. If the discharger determines that it is not feasible to achieve cleanup standards, the report shall evaluate the alternate standards that can be achieved.

Cessation of pumping will require that the Regional Board and EPA be in agreement, and should either party not agree, continued pumping will be required.



- 2) COMPLETION DATE; 30 days after the Regional Board approves onsite curtailment

TASK 18: IMPLEMENTATION OF ONSITE CURTAILMENT. Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 16.

f. STATUS REPORT

- 1) COMPLETION DATE: October 1, 1994

TASK 19: FIVE-YEAR STATUS REPORT AND EFFECTIVENESS EVALUATION. Submit a technical report acceptable to the Executive Officer containing the results of any additional investigation including the soil remediation study; an evaluation of the effectiveness of installed final cleanup measures and cleanup costs; additional recommended measures to achieve final cleanup standards, if necessary; a comparison of previous expected costs with the costs incurred and projected costs necessary to achieve cleanup standards; and the tasks and time schedule necessary to implement any additional final cleanup measures. This report shall also describe the reuse of extracted groundwater, evaluate and document the cleanup of polluted groundwater, and evaluate and document the removal and/or cleanup of polluted soil. If safe drinking water standards have not been achieved onsite and are not expected to be achieved through continued groundwater extraction and/or soil remediation, this report shall also contain an evaluation addressing whether it is technically feasible to achieve drinking-water quality onsite, and if so, a proposal for procedures to do so.

g. NEW HEALTH CRITERIA

- 1) COMPLETION DATE: 60 days after request made by the Executive Officer

TASK 20: EVALUATION OF NEW HEALTH CRITERIA. Submit a technical report acceptable to the Executive Officer which contains an evaluation of how the final plan and cleanup standards would be affected, if the concentrations as

listed in Specification B.4. change as a result of changes in source-document conclusions or promulgation of drinking water standards, maximum contaminant levels or action levels, or maximum contaminant level goals.

h. NEW TECHNICAL INFORMATION

- 1) COMPLETION DATE: 60 days after request made by the Executive Officer

TASK 21: EVALUATION OF NEW TECHNICAL INFORMATION. Submit a technical report acceptable to the Executive Officer which contains an evaluation of new technical and economic information which indicates that cleanup standards in some areas may be considered for revision. Such technical reports shall not be required unless the Executive Officer or Regional Board determines that such new information indicates a reasonable possibility that the Order may need to be changed under the criteria described in Finding 11.

i. FATE OF CHEMICALS

- 1) COMPLETION DATE: November 17, 1989

TASK 22: DETECTION OF VINYL CHLORIDE. Submit a technical report consisting of Part I and Part II, acceptable to the Executive Officer concerning the detection of vinyl chloride. Part I shall contain a review and evaluation of the existing sampling and analysis program directed at establishing procedures that will consistently utilize detection limits for vinyl chloride that will not exceed 1 ppb or ug/l. This may entail collecting split samples to be analyzed only for vinyl chloride. The report shall include a recommended procedure to be followed, beginning upon concurrence by the Executive Officer.

Part II shall contain a review of the presence or potential presence of vinyl chloride within the plume, including the suite of chemicals identified onsite which include VOCs that may degrade or transform into vinyl chloride. The review shall include a discussion of the various pathways that may be followed by

antecedant VOCs in the degradation or transformation process and the time periods involved. The report shall be as specific as possible for the AMI Building 1 site. If the report concludes that vinyl chloride will not be formed at this site, documentation to support this conclusion shall be provided.

3. The submittal of technical reports evaluating additional final remedial measures will include a projection of the cost, effectiveness, benefits, and impact on public health, welfare, and environment of each alternative measure. If any additional remedial investigations or feasibility studies are found to be necessary, they shall be consistent with the guidance provided by Subpart F of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), Section 25356.1 (c) of the California Health and Safety Code, CERCLA/SARA guidance documents, the State Board's Resolution No. 68-16, and this Order.
4. If the discharger is delayed, interrupted or prevented from complying with this Order or meeting one or more of the time schedules in this Order, the discharger shall promptly notify the Executive Officer. In the event of such delays or noncompliance, the Regional Board will consider modification of the time schedules established in this Order.
5. Every four months beginning on November 15, 1990 (subsequent due dates being March 15, July 15, and November 15 of each year) or as required by the Executive Officer, the discharger shall submit a periodic report on the progress of the remedial program during the previous reporting period. Reports shall include, but need not be limited to, updated water table and piezometric surface maps for all affected water-bearing zones, and appropriately scaled and detailed base maps showing the locations of all monitoring wells and extraction wells and piezometers, and identifying adjacent facilities and structures. Geological maps and/or cross-sections describing the hydrogeological setting of the site shall be provided in the first status report for each calendar year that this Order is in effect. Each report shall include isoconcentration maps of VOCs in groundwater, including but not limited to 1,1,1-TCA, 1,1-DCA, and 1,1-DCE. Each map will show the position(s) of the line(s) of equal concentration which represent the cleanup standard and other iso-lines to show where concentrations are higher and lower than the cleanup standard, as may be appropriate.

6. On an annual basis beginning on March 15, 1991 or as required by the Executive Officer, the discharger's March 15 progress reports shall include, but need not be limited to, an evaluation of the progress of cleanup measures and the feasibility of meeting groundwater and soil cleanup standards established in this Order. If the discharger determines that it is not feasible to meet the cleanup standards established by this Order, the report shall also contain an evaluation of maximum cleanup standards that could be achieved. If the discharger determines that it is not feasible to meet the soil cleanup standard, the report shall evaluate the potential for chemicals in soils to threaten the quality of the waters of the State and shall evaluate whether public health and the environment are protected.

The report shall include the current status of Building 1 and a description of the projected use of Building 1 during the coming year, by calendar quarters.

7. All hydrogeological plans, specifications, reports and documents shall be signed by or stamped with the seal of a registered geologist, engineering geologist or professional engineer.
8. All samples shall be analyzed by laboratories certified to perform analysis on Hazardous Materials or laboratories using approved EPA methods or an equivalent method acceptable to the Executive Officer. The discharger shall request laboratories to follow EPA guidance, "Documentation Requirements for Data Validation of Non-CLP Laboratory Data for Organic and Inorganic Analyses", dated May 1988, for preparation of data validation packages when required by the Executive Officer. The discharger shall request the laboratories to maintain quality assurance/quality control records for Regional Board review for six years and will inform the Regional Board of each laboratory's response.
9. The discharger shall maintain in good working order, and operate as efficiently as possible, any facility or control system or monitoring system installed to achieve compliance with this Order.
10. Copies of all correspondence, reports, and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided to:
  - a. Santa Clara Valley Water District
  - b. Santa Clara County Health Department
  - c. City of Santa Clara


- d. State Department of Health Services/Toxic Substances Control Division
- e. U.S. Environmental Protection Agency, Region IX (H-6-3)

Additional copies of correspondence, reports and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided for public use when requested by the Executive Officer.

- 11. The discharger shall permit the Regional Board or its authorized representative, in accordance with Section 13267 (c) of the California Water Code:
  - a. Entry upon premises in which any pollution sources exist, or may potentially exist, or in which any required records are kept, which are relevant to this Order.
  - b. Access to copy any records required to be kept under the terms and conditions of this Order.
  - c. Inspection of any monitoring equipment or methodology implemented in response to this Order.
  - d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.
- 12. The discharger shall file a report on any changes in site occupancy and ownership associated with the facility described in this Order.
- 13. If any hazardous substance is discharged in or on any waters of the State, or discharged and deposited where it is, or probably will be discharged in or on any waters of the State, the discharger shall immediately report such discharge to this Regional Board, at (415) 464-1255 on weekdays during office hours from 8 a.m. to 5 p.m., and to the Office of Emergency Services at (800) 852-7550 during non-office hours. A written report shall be filed with the Regional Board within five working days and shall contain information relative to: the nature of waste or pollutant, quantity involved, duration of incident, cause of spill, Spill Prevention and Containment Plan (SPCC) in effect, if any, estimated size of affected area, nature of effects, corrective measures that have been taken or planned, and a schedule of these activities, and persons notified.

14. The Regional Board will review this Order periodically and may revise the requirements when necessary under the criteria in Finding No. 12.
15. Regional Board Order No. 86-71 is hereby rescinded.

I, Steven R. Ritchie, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on September 19, 1990.



STEVEN R. RITCHIE  
Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

APPLIED MATERIALS, INC.  
3050 BOWERS AVENUE BUILDING 1 FACILITY  
CITY OF SANTA CLARA, SANTA CLARA COUNTY  
GROUNDWATER SELF-MONITORING PROGRAM

A. GENERAL

Reporting responsibilities of waste dischargers are specified in Sections 13225(a), 13267(b), 13268, 13383, and 13387(b) of the California Water Code and this Regional Board's Resolution No. 73-16.

The principal purposes of a waste discharger's monitoring program, also referred to as a self-monitoring program, are: (1) To document compliance with site cleanup requirements and prohibitions established by this Regional Board, (2) To facilitate self-policing by the waste discharger in the prevention and abatement of pollution arising from waste discharge, (3) To develop or assist in the development of effluent or other limitations, discharger prohibitions, national standards of performance, pretreatment and toxicity standards, and other standards, and (4) To prepare water and wastewater quality inventories.

B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analyses shall be performed according to the EPA Method 8000 series described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," dated November 1986; or other methods approved and specified by the Executive Officer of this Regional Board.

C. REPORTS TO BE FILED WITH THE REGIONAL BOARD

1. Violations or Potential Violations of Requirements

- a. The discharger shall file a written technical report at least 15 days prior to advertising for bid on any construction project which may potentially adversely effect the dischargers' soil and groundwater cleanup activities. All projects involving subsurface construction shall be reported.
- b. In the event the discharger is unable to comply with the conditions of the site cleanup requirements and prohibitions due to:
  - (1) maintenance work, power failures, or breakdown of waste treatment equipment, or
  - (2) accidents caused by human error or negligence, or
  - (3) other causes such as acts of nature, or
  - (4) poor operation or inadequate system design,

the waste discharger shall promptly accelerate the pertinent portions of the monitoring program to weekly or as required by the Regional Board's Executive Officer for those constituents which have been violated. Such analysis shall continue until such time as the discharger is back in compliance with the conditions and prohibitions of the site cleanup requirements, or until such time as the Executive Officer determines to be appropriate. The results of such monitoring shall be included in the regular Self-Monitoring Report.

## 2. Bypass Reports

Bypass reporting shall be an integral part of the regular monitoring program report. A report on bypassing of treatment units shall be made which will include cause, time and date, duration and estimated volume bypassed, method used in estimating volume, and persons and agencies notified. Notification to the Regional Board shall be made immediately by telephone (415-464-1255), followed by a written account within 15 days.

## 3. Self-Monitoring Reports

### a. Reporting Period:

Written reports shall be filed regularly within forty-five days from the end of the period monitored. The first report is due November 15, 1990.

### b. Letter of Transmittal:

A letter transmitting self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period and actions taken or planned for correcting any requirement violation. If the dischargers have previously submitted a detailed time schedule for correcting requirement violations, a reference to this correspondence will be satisfactory. Monitoring reports and the letter transmitting reports shall be signed by either a principal executive officer or his duly authorized employee. The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true and correct.

### c. Data Results:

- (1) Results from each required analysis and observation shall be submitted in the self-monitoring regular reports. Results shall also be submitted for any additional analyses performed by the discharger at the specific request of the Board. Bimonthly water level data shall also be submitted in the monitoring report.
- (2) Monitoring reports shall contain data on the status of installation and operation of any soil remediation system, including, as appropriate, soil boring logs, well construction details, results from soil chemical testing, air monitoring results (laboratory chemical analyses, OVA monitoring, and flow measurements), and an evaluation of the effectiveness of the system in removing volatile chemicals from soils continuing greater than 1 ppm total VOCs.



- (3) The monitoring report shall include a discussion of unexpected operational changes which could affect performance of the extraction system, such as flow fluctuations, maintenance shutdown, etc.
- (4) The monitoring report shall also identify the analytical procedures used for analyses either directly in the report or by reference to a standard plan accepted by the Executive Officer. Any special methods shall be identified and shall have prior approval of the Board's Executive Officer.
- (5) Original lab results shall be retained and shall be made available for inspection for six years after origination or until after all continuing or impending legal or administrative actions are resolved.
- (6) Maps shall accompany the monitoring report, showing sampling locations and pollutant plume contours .
- (7) The dischargers shall describe in the monitoring report the effectiveness of the actions taken to regain compliance if compliance is not achieved. The effectiveness evaluation shall include the basis of determining the effectiveness, water surface elevations for each well used to determine water surface elevation contours and water quality data.
- (8) The annual report shall be combined with the monitoring report submitted on March 15 of each year and shall include cumulative data for the current year for each parameter of the attached Table 2 (Revised). The annual report shall also include minimum, maximum, median and average water quality data for the year. Water level data and GC/MS results shall be included in the annual report. The annual report shall also include contour maps for each chemical present above detectable concentrations.

b. Self-Monitoring Program (SMP) Revisions:

Additional long term or temporary changes in the sample collection frequency and routine chemical analysis may become warranted as monitoring needs change. These changes shall be based on the following criteria and shall be proposed in a quarterly report. The changes shall be implemented no earlier than 45 days after a self-monitoring report is submitted for review or not at all if the proposal is found to be unacceptable by the Executive Officer.

Criteria for SMP revisions:

- (1) Discontinued analysis for a routine chemical parameter for a specific well after a one-year period of below detection limit values for that parameter.
- (2) Changes in sampling frequency for a specific well after a one-year period of below detection limit values for all chemical parameters from that well.
- (3) Temporary increases in sampling frequency or changes in requested chemical parameters for a well or group of wells because of a

change in data needs (e.g., evaluating groundwater extraction effectiveness or other cleanup strategies).

- (4) Add routine analysis for a chemical parameter if the parameter appears as an additional chromatographic peak in three consecutive samples from a particular well.
- (5) Add routine chemical parameters for new wells based on the results of initial GC/MS analysis.
- (6) Alter sampling frequency based on evaluation of collective data base.
- (7) Following a temporary increase in sampling frequency, as described in C.1, the regular sampling frequency will resume after 4 samples show stable or decreasing concentrations provided the sampling indicates compliance with the Site Cleanup Requirements.

#### D. DESCRIPTION OF SAMPLING STATIONS

Groundwater:

<u>Stations</u>	<u>Description</u>
Listed in Table 1 and shown in Figure 2	Monitoring and extraction wells, and piezometers

#### E. SCHEDULE OF SAMPLING AND ANALYSIS

The schedule of sampling and analysis shall be as given herein:

1. Once every four months, while cleanup standards are being achieved, representative samples shall be collected for analyses from all onsite and offsite extraction and monitoring wells listed in Table 1 and as shown on Figure 2, excluding the three piezometers. All samples of one event shall be collected at approximately the same time.
2. After cleanup standards have been achieved, samples shall be collected for analyses from all monitoring and extraction wells identified in 1. above, quarterly (every three months) during the one-year stability period.
4. Following completion of the stability period, samples shall be collected for analyses from all identified wells, twice annually during the long-term monitoring period, as long as cleanup standards are not exceeded, or as shall be determined by the Executive Officer.

In addition, if a previously undetected compound or peak is detected in a sample from a well, a second sample shall be taken within a week after the results from the first sample are available. All chromatographic peaks detected in two consecutive samples for purgeable halocarbons and/or volatile organics shall be identified and quantified in the monitoring report.

A GC/MS analysis shall be performed annually and all peaks identified and reported for all operating extraction wells and pits.

A GC/MS analysis shall be performed on each new well immediately after installation and well development and all peaks identified and reported on each well in the next monitoring report.

Groundwater elevations shall be obtained on a bimonthly basis from each monitoring and extraction well and piezometer listed in Table 1. Groundwater levels shall be obtained from all AM and HP wells, and Avantek wells as may be available, in the vicinity of the Building 1 facility as shown on Figure 2, every four months.

Depths of wells in Table 1 shall be determined on an annual basis and compared to the depth of the well as constructed.

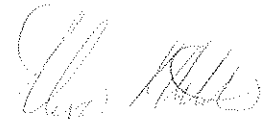
The depth of the pump and the groundwater elevation at the time of sampling shall be determined and submitted in the monitoring report with the sampling results.

I, Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data to determine compliance with Regional Board Order No. 90-134.
2. Is effective on the date shown below.
3. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger and revisions will be ordered by the Executive Officer.

Effective Date: September 19, 1990

Attachments: Tables 1,2  
Figures 1,2



Steven R. Ritchie  
Executive Officer

TABLE 1  
 LIST OF WELLS IDENTIFIED FOR THE SELF-MONITORING PROGRAM  
 FOR  
 APPLIED MATERIALS, INC.  
 3050 BOWERS AVENUE BUILDING 1 FACILITY  
 SANTA CLARA

Onsite Wells

<u>Extraction</u>	<u>Monitoring</u>	<u>Piezometers</u>
AM1-1	AM1-2	P-1
AM1-5E	AM1-3	P-2
AM1-EP	AM1-4	P-3
AM1-10	AM1-5 & AM1-5B	
	AM1-6	
	AM1-7	
	AM1-8	
	AM1-9	

Offsite Wells

HP-1  
 HP-6

Refer to Figure 1 for the location of the Applied Materials, Inc. 3050 Bowers Avenue facility in Santa Clara, and Figure 2 for the locations of all wells identified in Table 1.

TABLE 2 (REVISED)  
FINAL CLEANUP STANDARDS

APPLIED MATERIALS, INC.  
3050 BOWERS AVENUE BUILDING 1 FACILITY  
SANTA CLARA

<u>Chemical</u>	<u>Standard (ppb or ug/l)</u>
1,1-DCA	5
1,2-DCA	0.5
1,1-DCE	6
1,2-DCE	6
cis	6
trans	10
PCE	5
1,1,1-TCA	200
1,1,2-TCA	32
TCE	5
Freon 113	1,200
Freon 11	150
Chloroform	6
Vinyl chloride	0.5

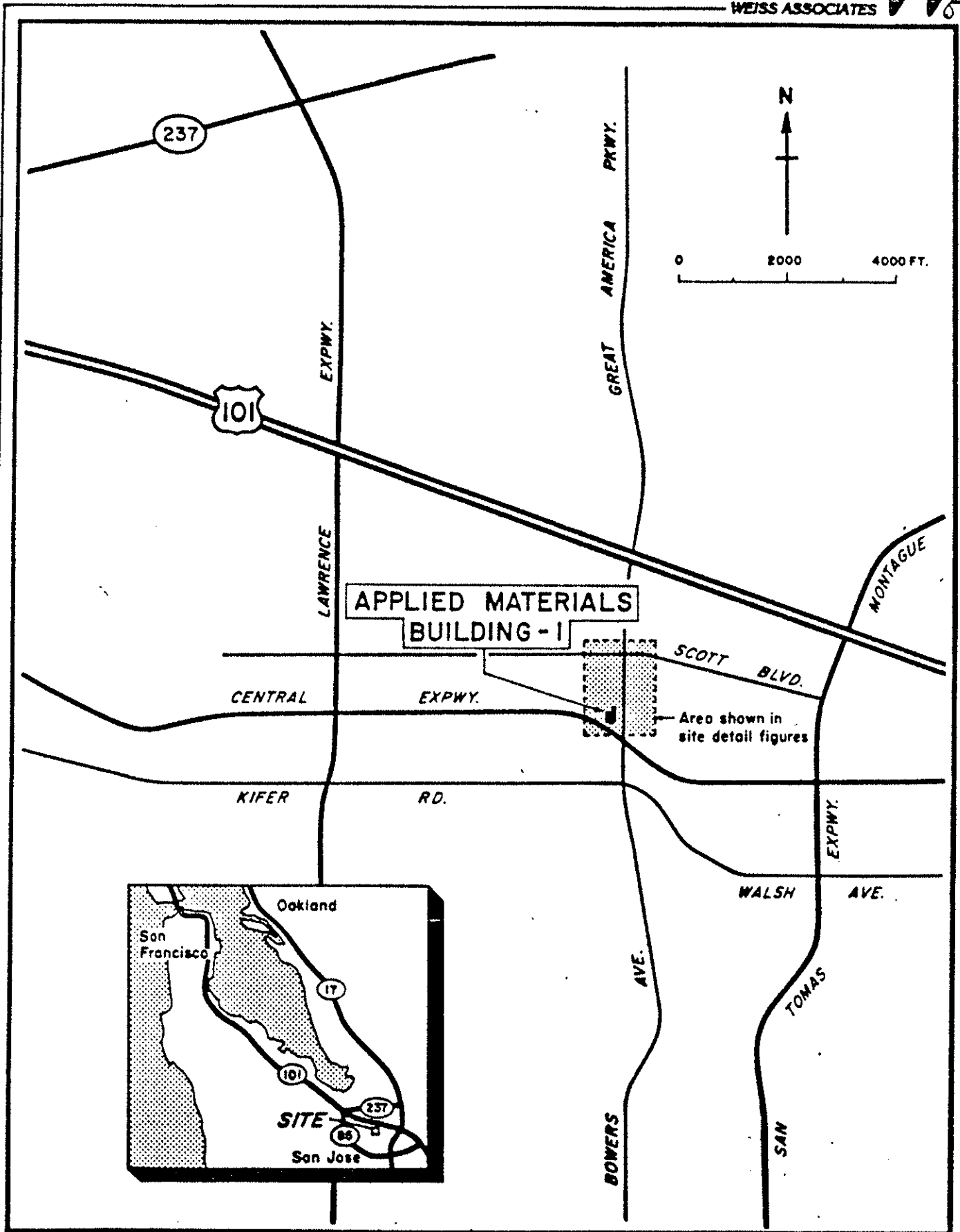


Figure 1. Location of Applied Materials Building 1

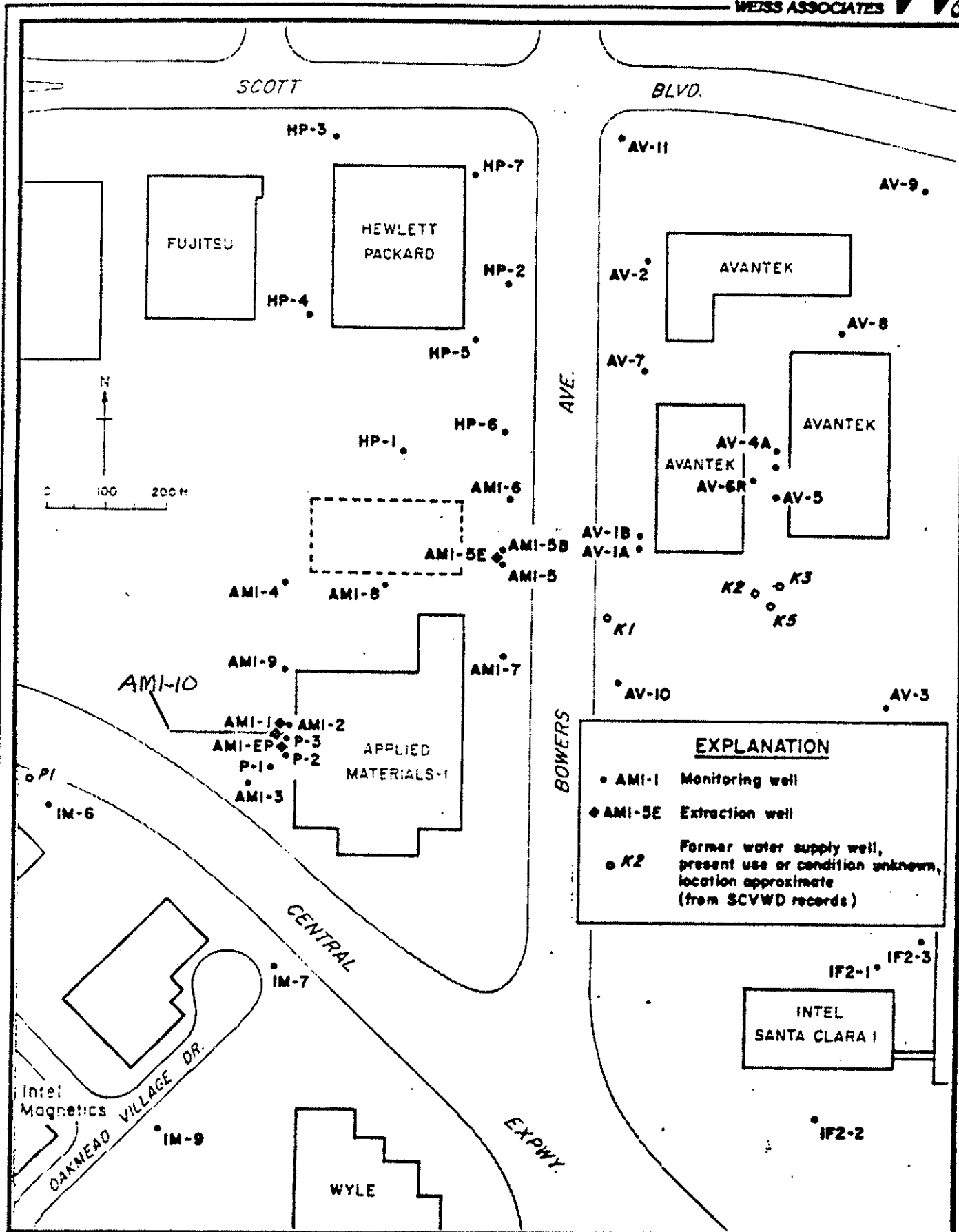


Figure 2. Well Locations - Applied Materials Building 1 and Vicinity